

What is claimed is:

1. A sensor array for detecting a gas phase material, the array comprising:
a substrate surface;

5 at least one line of receptor material on the substrate surface, wherein the gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

10 a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the line of receptor material and opening in alternating first and second opposing directions along the line of receptor material; and

15 a comb electrode on the substrate surface, the comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the line of receptor material.

2. An array according to claim 1, wherein the serpentine electrode and the comb electrode each comprise a connection pad.

20 3. An array according to claim 1, wherein the receptor material is located between the substrate surface and the serpentine electrode where the first line and the serpentine electrode intersect.

25 4. An array according to claim 1, wherein the gas phase material preferentially deposits on the receptor material as compared to the serpentine electrode and the comb electrode.

5. A sensor array for detecting a gas phase material, the array comprising:
a substrate surface;

30 at least two lines of receptor material on the substrate surface, wherein the gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the lines of receptor material and opening in alternating first and second opposing directions along the lines of receptor material; and

5 a comb electrode on the substrate surface, the comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the lines of receptor material.

10 6. An array according to claim 5, wherein the at least two lines of receptor material do not intersect with each other.

7. An array according to claim 5, wherein the at least two lines of receptor material are generally aligned with and spaced from each other.

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8. An array according to claim 5, wherein the at least two lines of receptor material are straight lines parallel to each other.

9. A sensor array for detecting a gas phase material, the array comprising:
20 a substrate surface;

at least one line of receptor material on the substrate surface, wherein the gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

25 a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the line of receptor material and opening in alternating first and second opposing directions along the line of receptor material;

30 a first comb electrode on the substrate surface, the first comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at

least some of the tines extending into the U-shaped segments intersect the line of receptor material; and

5 a second comb electrode on the substrate, the second comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the second direction, and further wherein at least some of the tines of the second comb electrode extending into the U-shaped segments intersect the line of receptor material.

10 10. An array according to claim 9, wherein the serpentine electrode, the first comb electrode, and the second comb electrode each comprise a connection pad.

11. An array according to claim 9, wherein the first and second comb electrodes are connected to a common connector pad.

15 12. A sensor array for detecting a gas phase material, the array comprising:
a substrate surface;

at least two lines of receptor material on the substrate surface, wherein the selected material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

20 a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the lines of receptor material and opening in alternating first and second opposing directions along the lines of receptor material;

25 a first comb electrode on the substrate surface, the first comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the lines of receptor material; and

30 a second comb electrode on the substrate, the second comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the second direction, and further wherein at least some of

the tines of the second comb electrode extending into the U-shaped segments intersect the lines of receptor material.

5 13. An array according to claim 12, wherein the at least two lines of receptor material do not intersect with each other.

14. An array according to claim 12, wherein the at least two lines of receptor material are generally aligned with and spaced from each other.

10 15. An array according to claim 12, wherein the at least two lines of receptor material are straight lines parallel to each other.

16. An array according to claim 12, wherein the serpentine electrode, the first comb electrode, and the second comb electrode each comprise a connection pad.

15 17. An array according to claim 12, wherein the first and second comb electrodes are connected to a common connector pad.

20 18. A method of detecting a gas phase material, the method comprising:
providing a sensor array comprising:

a substrate surface;

at least one line of receptor material on the substrate surface,
wherein the gas phase material preferentially deposits on the receptor
material as compared to the substrate surface surrounding the receptor
25 material;

a serpentine electrode on the substrate surface, the serpentine
electrode comprising a plurality of U-shaped segments spaced along the line
of receptor material and opening in alternating first and second opposing
directions along the line of receptor material; and

5 a comb electrode on the substrate surface, the comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the line of receptor material;
exposing the sensor array to the gas phase material; and
monitoring electrical conductivity between the serpentine electrode and the comb electrode.

10 19. A method according to claim 18, further comprising activating an alarm when the electrical conductivity between the serpentine electrode and the comb electrode reaches a predetermined limit.

20. A method according to claim 18, further comprising heating the sensor array.

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21. A method according to claim 18, wherein exposing the sensor array to the gas phase material comprises ruthenium.

20 22. A method of detecting a gas phase material, the method comprising:
providing a sensor array comprising:

a substrate surface;

25 at least two lines of receptor material on the substrate surface, wherein the gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the lines of receptor material and opening in alternating first and second opposing directions along the lines of receptor material; and

30 a comb electrode on the substrate surface, the comb electrode comprising a plurality of tines, wherein at least some of the tines extend into

at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the lines of receptor material a substrate surface;

exposing the sensor array to the gas phase material; and

5 monitoring electrical conductivity between the serpentine electrode and the comb electrode.

23. A method according to claim 22, further comprising activating an alarm when the electrical conductivity between the serpentine electrode and the comb electrode
10 reaches a predetermined limit.

24. A method according to claim 22, further comprising heating the sensor array.

25. A method according to claim 22, wherein exposing the sensor array to the gas
15 phase material comprises ruthenium.

26. A method of detecting a gas phase material, the method comprising:
providing a sensor array comprising:

a substrate surface;

20 at least one line of receptor material on the substrate surface,
wherein the gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

25 a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the line of receptor material and opening in alternating first and second opposing directions along the line of receptor material;

30 a first comb electrode on the substrate surface, the first comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first

direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the line of receptor material; and

5 a second comb electrode on the substrate, the second comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the second direction, and further wherein at least some of the tines of the second comb electrode extending into the U-shaped segments intersect the line of receptor material;

exposing the sensor array to the gas phase material; and

10 monitoring electrical conductivity between the serpentine electrode and at least one of the first and second comb electrodes.

27. A method according to claim 26, further comprising activating an alarm when the electrical conductivity between the serpentine electrode and at least one of the first and second comb electrodes reaches a predetermined limit.

28. A method according to claim 26, further comprising heating the sensor array.

29. A method according to claim 26, wherein exposing the sensor array to the gas phase material comprises ruthenium.

30. A method of detecting a gas phase material, the method comprising:
providing a sensor array comprising:

a substrate surface;

25 at least two lines of receptor material on the substrate surface, wherein the selected material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

30 a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the lines of receptor material and opening in alternating first and second opposing directions along the lines of receptor material;

a first comb electrode on the substrate surface, the first comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the lines of receptor material; and

a second comb electrode on the substrate, the second comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the second direction, and further wherein at least some of the tines of the second comb electrode extending into the U-shaped segments intersect the lines of receptor material;

exposing the sensor array to the gas phase material; and

monitoring electrical conductivity between the serpentine electrode and at least one of the first and second comb electrodes.

31. A method according to claim 30, further comprising activating an alarm when the electrical conductivity between the serpentine electrode and at least one of the first and second comb electrodes reaches a predetermined limit.

32. A method according to claim 30, further comprising heating the sensor array.

33. A method according to claim 30, wherein exposing the sensor array to the gas phase material comprises ruthenium.

34. A system for detecting a gas phase material, the system comprising:
a sensor array comprising:

a substrate surface;

at least one line of receptor material on the substrate surface, wherein the gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the line of receptor material and opening in alternating first and second opposing directions along the line of receptor material; and

5 a comb electrode on the substrate surface, the comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the line of receptor material; and

10 a detector in electrical communication with the serpentine electrode and the comb electrode.

35. A system according to claim 34, further comprising a heater.

15 36. A system for detecting a gas phase material, the system comprising:
a sensor array comprising:

a substrate surface;

20 at least two lines of receptor material on the substrate surface, wherein the gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

25 a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the lines of receptor material and opening in alternating first and second opposing directions along the lines of receptor material; and

30 a comb electrode on the substrate surface, the comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the lines of receptor material a substrate surface; and

a detector in electrical communication with the serpentine electrode and the comb electrode.

37. A system according to claim 36, further comprising a heater.

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38. A system for detecting a gas phase material, the system comprising:
a sensor array comprising:

a substrate surface;

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at least one line of receptor material on the substrate surface,
wherein the gas phase material preferentially deposits on the receptor
material as compared to the substrate surface surrounding the receptor
material;

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a serpentine electrode on the substrate surface, the serpentine
electrode comprising a plurality of U-shaped segments spaced along the line
of receptor material and opening in alternating first and second opposing
directions along the line of receptor material;

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a first comb electrode on the substrate surface, the first comb
electrode comprising a plurality of tines, wherein at least some of the tines
extend into at least some of the U-shaped segments opening in the first
direction, and further wherein at least some of the tines extending into the U-
shaped segments intersect the line of receptor material; and

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a second comb electrode on the substrate, the second comb
electrode comprising a plurality of tines, wherein at least some of the tines
extend into at least some of the U-shaped segments opening in the second
direction, and further wherein at least some of the tines of the second comb
electrode extending into the U-shaped segments intersect the line of receptor
material; and

a detector in electrical communication with the serpentine electrode, the first
comb electrode and the second comb electrode.

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39. A system according to claim 38, further comprising a heater.

40. A system for detecting a gas phase material, the system comprising:

a sensor array comprising:

a substrate surface;

5 at least two lines of receptor material on the substrate surface, wherein the selected material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material;

10 a serpentine electrode on the substrate surface, the serpentine electrode comprising a plurality of U-shaped segments spaced along the lines of receptor material and opening in alternating first and second opposing directions along the lines of receptor material;

15 a first comb electrode on the substrate surface, the first comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the first direction, and further wherein at least some of the tines extending into the U-shaped segments intersect the lines of receptor material; and

20 a second comb electrode on the substrate, the second comb electrode comprising a plurality of tines, wherein at least some of the tines extend into at least some of the U-shaped segments opening in the second direction, and further wherein at least some of the tines of the second comb electrode extending into the U-shaped segments intersect the lines of receptor material; and

25 a detector in electrical communication with the serpentine electrode, the first comb electrode and the second comb electrode.

41. A system according to claim 40, further comprising a heater.

42. A sensor array for detecting a metallic compound in a gas phase material,
the array comprising:

a substrate surface;

at least one line of receptor material attached to the substrate surface,

5 wherein a metallic compound in a gas phase material preferentially deposits on the
receptor material as compared to the substrate surface surrounding the receptor
material; and

at least two electrodes attached to the substrate surface, wherein the at least
two electrodes intersect the at least one line of receptor material in multiple
10 locations such that a plurality of potential conductive paths are created between the
at least two electrodes are created by the at least one line of receptor material.

43. A sensor array according to claim 42, wherein the receptor material is
located between the substrate surface and the at least two electrodes where the at
15 least one line of receptor material and the at least two electrodes intersect.

44. A sensor array according to claim 42, wherein the metallic compound in the
gas phase material preferentially deposits on the receptor material as compared to
the at least two electrodes.

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45. A sensor array for detecting a metallic compound in a gas phase material,
the array comprising:

a substrate surface;

at least two lines of receptor material attached to the substrate surface,

25 wherein a metallic compound in a gas phase material preferentially deposits on the
receptor material as compared to the substrate surface surrounding the receptor
material; and

at least two electrodes attached to the substrate surface, wherein the at least
two electrodes intersect the at least two lines of receptor material in multiple

locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least two lines of receptor material.

46. A sensor array according to claim 45, wherein the at least two lines of receptor material do not intersect each other.

47. A sensor array according to claim 45, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least two lines of receptor material and the at least two electrodes intersect.

48. A sensor array according to claim 45, wherein the metallic compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

49. A method of detecting a metallic compound in a gas phase material, the method comprising:

providing a sensor array comprising:

a substrate surface;

at least one line of receptor material attached to the substrate surface, wherein a metallic compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least one line of receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least one line of receptor material;

exposing the sensor array to the gas phase material that comprises the metallic compound; and

monitoring electrical conductivity between the at least two electrodes.

50. A method according to claim 49, further comprising activating an alarm when the electrical conductivity between the at least two electrodes reaches a predetermined limit.

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51. A method according to claim 49, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least one line of receptor material and the at least two electrodes intersect.

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52. A method according to claim 49, wherein the metallic compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

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53. A method of detecting a metallic compound in a gas phase material, the method comprising:

providing a sensor array comprising:

a substrate surface;

at least two lines of receptor material attached to the substrate surface, wherein a metallic compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

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at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least two lines of receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least two lines of receptor material;

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exposing the sensor array to the gas phase material that comprises the metallic compound; and

monitoring electrical conductivity between the at least two electrodes.

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54. A method according to claim 53, further comprising activating an alarm when the electrical conductivity between the at least two electrodes reaches a predetermined limit.

5 55. A method according to claim 53, wherein the at least two lines of receptor material do not intersect each other.

56. A method according to claim 53, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least one
10 line of receptor material and the at least two electrodes intersect.

57. A method according to claim 53, wherein the metallic compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

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58. A system for detecting a metallic compound in a gas phase material, the system comprising:

a sensor array comprising:

a substrate surface;

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at least one line of receptor material attached to the substrate surface, wherein a metallic compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

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at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least one line of receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least one line of receptor material; and

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a detector in electrical communication with the at least two electrodes.

59. A system according to claim 58, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least one line of receptor material and the at least two electrodes intersect.

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60. A system according to claim 58, wherein the metallic compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

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61. A system for detecting a metallic compound in a gas phase material, the system comprising:

a sensor array comprising:

a substrate surface;

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at least two lines of receptor material attached to the substrate surface, wherein a metallic compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

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at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least two lines of receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least two lines of receptor material; and

25

a detector in electrical communication with the at least two electrodes.

62. A system according to claim 61, wherein the at least two lines of receptor material do not intersect each other.

63. A system according to claim 61, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least two lines of receptor material and the at least two electrodes intersect.

5 64. A system according to claim 61, wherein the metallic compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

10 65. A sensor array for detecting a ruthenium compound in a gas phase material, the array comprising:

a substrate surface;

at least one line of receptor material attached to the substrate surface,

wherein a ruthenium compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

15 at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least one line of receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least one line of receptor material.

20 66. A sensor array according to claim 65, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least one line of receptor material and the at least two electrodes intersect.

25 67. A sensor array according to claim 65, wherein the ruthenium compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

68. A sensor array for detecting a ruthenium compound in a gas phase material, the array comprising:

a substrate surface;

at least two lines of receptor material attached to the substrate surface,

5 wherein a ruthenium compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

10 at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least two lines of receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least two lines of receptor material.

69. A sensor array according to claim 68, wherein the at least two lines of receptor material do not intersect each other.

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70. A sensor array according to claim 68, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least two lines of receptor material and the at least two electrodes intersect.

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71. A sensor array according to claim 68, wherein the ruthenium compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

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72. A method of detecting a ruthenium compound in a gas phase material, the method comprising:

providing a sensor array comprising:

a substrate surface;

at least one line of receptor material attached to the substrate surface, wherein a ruthenium compound in a gas phase material

preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

at least two electrodes attached to the substrate surface,
wherein the at least two electrodes intersect the at least one line of
receptor material in multiple locations such that a plurality of
potential conductive paths are created between the at least two
electrodes are created by the at least one line of receptor material;

exposing the sensor array to the gas phase material that comprises the ruthenium compound; and

monitoring electrical conductivity between the at least two electrodes.

73. A method according to claim 72, further comprising activating an alarm when the electrical conductivity between the at least two electrodes reaches a predetermined limit.

74. A method according to claim 72, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least one line of receptor material and the at least two electrodes intersect.

75. A method according to claim 72, wherein the ruthenium compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

76. A method of detecting a ruthenium compound in a gas phase material, the method comprising:

providing a sensor array comprising:

a substrate surface;

at least two lines of receptor material attached to the substrate surface, wherein a ruthenium compound in a gas phase

material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and
at least two electrodes attached to the substrate surface,
wherein the at least two electrodes intersect the at least two lines of
5 receptor material in multiple locations such that a plurality of
potential conductive paths are created between the at least two
electrodes are created by the at least two lines of receptor material;
exposing the sensor array to the gas phase material that comprises the
ruthenium compound; and
10 monitoring electrical conductivity between the at least two electrodes.

77. A method according to claim 76, further comprising activating an alarm when the electrical conductivity between the at least two electrodes reaches a predetermined limit.

78. A method according to claim 76, wherein the at least two lines of receptor material do not intersect each other.

79. A method according to claim 76, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least one line of receptor material and the at least two electrodes intersect.

80. A method according to claim 76, wherein the ruthenium compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

81. A system for detecting a ruthenium compound in a gas phase material, the system comprising:

a sensor array comprising:

a substrate surface;

at least one line of receptor material attached to the substrate surface, wherein a ruthenium compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least one line of receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least one line of receptor material;

and

a detector in electrical communication with the at least two electrodes.

82. A system according to claim 81, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least one line of receptor material and the at least two electrodes intersect.

83. A system according to claim 81, wherein the ruthenium compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.

84. A system for detecting a ruthenium compound in a gas phase material, the system comprising:

a sensor array comprising:

a substrate surface;

at least two lines of receptor material attached to the substrate surface, wherein a ruthenium compound in a gas phase material preferentially deposits on the receptor material as compared to the substrate surface surrounding the receptor material; and

at least two electrodes attached to the substrate surface, wherein the at least two electrodes intersect the at least two lines of

receptor material in multiple locations such that a plurality of potential conductive paths are created between the at least two electrodes are created by the at least two lines of receptor material; and

5 a detector in electrical communication with the at least two electrodes.

85. A system according to claim 84, wherein the at least two lines of receptor material do not intersect each other.

10 86. A system according to claim 84, wherein the receptor material is located between the substrate surface and the at least two electrodes where the at least two lines of receptor material and the at least two electrodes intersect.

15 87. A system according to claim 84, wherein the ruthenium compound in the gas phase material preferentially deposits on the receptor material as compared to the at least two electrodes.